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Special EP: Stellar Outcasts Rogue Planets

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Astrophysics: Deep In The Space With Maanvinder Pilania

Stellar Outcasts Rogue Planets

Hello and welcome back to the last episode of this podcast and as I promised in one of the earlier episodes, I'm back with an detailed episode on Rogue Planets but with that it is time to bid farewell. I'm uncertain whether I will record any new episodes in future or not however I shall continue my passion of being an amateur astronomer. That's why I will be focusing on writing rather than recording. So with the end of this episode, the podcast will be halted for an uncertain time because I will be busy with my blog called "Astronomia Oggi", which when translated from Italian means "Astronomy Today" in English. So before any further delay let's dive into another adventure through cosmos.

Rogue planets are planets with no parent star. So in other terms, they are orphan planets which are drifting across the space without any host star to revolve around. It could happen due to various reasons. They are just like other planets which means they can be gas giant, terrestrial or any other type. The only thing they're missing is the star from whose leftovers in a planetary disk they were formed. So what caused them to become rogue, leaving them in the eternal darkness of the space and will you be able to survive on such planet. Let's talk about what made them lone exoplanets.

Now I'm going to tell you about the reasons that certainly explain the reason behind them floating across the vastness of space. First it could have been ejected from its star system due to gravitational interactions with passing star and even other planets in its own star system. The other reason could be they formed from the proto-planetary disk of a star and without getting bound to the star and eventually getting ejected from the star. Like I mentioned earlier about them being of any type, it also means their mass range is also different. They can range from Earth sized to several times the mass of our local neighbor Jupiter.

So the next question that arises here is will you be able to survive on such planet? The answer is simply no. There are two reasons that are related to absence of an host star. In episode 4 of this season, I talked about Neptune's moon triton and how it is able to keep it slightly warm or just keeping it geologically active. In case of Triton, it is located in far reaches of solar system where Sun's light is not enough to keep it warm, thus keeping a liquid ocean beneath its nitrogen surface. So it derives most of its heat from the tidal interactions with Neptune which keeps its geologically active by means of Cryovolcanoes on its surface. So the question I wanna ask you here is that is it possible in case of a planet, let's say a terrestrial one? The simple answer is no. As a rogue planet does not have an companion, so it will be so cold. However, the case of Triton is possible if a rogue planet has its own natural satellite and normally as interstellar space is full of cosmic rays and all sorts of other rays, it would be stripped of its atmosphere meaning if it have any ice on its surface, will be sent into the space. Now let's consider

the other reason which is of course the absence of a host star, means the planet will be much colder and darker and if somehow the planet kept hold of its atmosphere, there is no chance for life to thrive at such a place. So are these two conditions the only way life can survive? Some rogue planets could have a subsurface ocean that is kept warm by internal heat or radioactivity of a planet, raising the possibilities of habitability. The universe is a wild place with possibilities that are beyond one's imagination.

According to an estimate, there are about 20 rogue planets for every star in a galaxy and imagine putting this number in the total estimate of stars in our Milky Way alone which is more than 200 billion stars. The number of rogue planets are huge in the universe, it's like they are seeds of an plant which failed to grow up scattered in a field along with the grow up ones that are now plants. And this brings me to the last question that is probably in your mind. How do we know they exist? Or how they are detected?

Since they don't have any host star to orbit, you cannot detect them via transit method or radial velocity. They are dark due to the fact neither they nor they have any light of their own nor are visible against the backdrop of space. However, they can be detected via gravitational microlensing, a method which I explained in the episode about exoplanets. You might wanna check it out, in case you don't have any clue about it.

In case you are wondering about future observations or detection of such planets, then NASA has come up with an answer to it with their new space telescope called The Nancy Grace Roman Space Telescope. It will use gravitational microlensing to detect new rogue planets in deep regions of the Milky Way. Its wide angle view is 100 times bigger than that of the Hubble Space Telescope. Imagine how this new telescope will revolutionize our understanding about these lone planets and if its combined with the James Webb Space Telescope, they might tell help us improve our understanding of them. In any case I take my leave here for an uncertain time but you can find my new work at Astronomia Oggi Blog.

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